

44 MW (150 million Btu/hr) heat input design capacity.

(3) Monitor and record the periods of operation of the boiler or process heater if the design input capacity of the boiler is 44 MW (150 million Btu/hr) or greater. The records must be readily available for inspection.

(d) The owner or operator of an affected facility that seeks to demonstrate compliance with the TRE index value limit specified under § 60.612(c) shall install, calibrate, maintain, and operate according to manufacturer's specifications the following equipment, unless alternative monitoring procedures or requirements are approved for that facility by the Administrator:

(1) Where an absorber is the final recovery device in a recovery system:

(i) A scrubbing liquid temperature monitoring device having an accuracy of  $\pm 1$  percent of the temperature being monitored expressed in degrees Celsius or  $0.5^\circ\text{C}$ , whichever is greater, and a specific gravity monitoring device having an accuracy of 0.02 specific gravity units, each equipped with a continuous recorder;

(ii) An organic monitoring device used to indicate the concentration level of organic compounds exiting the recovery device based on a detection principle such as infra-red, photoionization, or thermal conductivity, each equipped with a continuous recorder.

(2) Where a condenser is the final recovery device in a recovery system:

(i) A condenser exit (product side) temperature monitoring device equipped with a continuous recorder and having an accuracy of  $\pm 1$  percent of the temperature being monitored expressed in degrees Celsius or  $0.5^\circ\text{C}$ , whichever is greater;

(ii) An organic monitoring device used to indicate the concentration level of organic compounds exiting the recovery device based on a detection principle such as infra-red, photoionization, or thermal conductivity, each equipped with a continuous recorder.

(3) Where a carbon adsorber is the final recovery device in a recovery system:

(i) An integrating steam flow monitoring device having an accuracy of 10 percent, and a carbon bed temperature

monitoring device having an accuracy of  $\pm 1$  percent of the temperature being monitored expressed in degrees Celsius or  $\pm 0.5^\circ\text{C}$ , whichever is greater, both equipped with a continuous recorder;

(ii) An organic monitoring device used to indicate the concentration level of organic compounds exiting the recovery device based on a detection principle such as infra-red, photoionization, or thermal conductivity, each equipped with a continuous recorder.

(e) An owner or operator of an affected facility seeking to demonstrate compliance with the standards specified under § 60.612 with control devices other than an incinerator, boiler, process heater, or flare; or recovery devices other than an absorber, condenser, or carbon adsorber shall provide to the Administrator information describing the operation of the control device or recovery device and the process parameter(s) which would indicate proper operation and maintenance of the device. The Administrator may request further information and will specify appropriate monitoring procedures or requirements.

#### § 60.614 Test methods and procedures.

(a) For the purpose of demonstrating compliance with § 60.612, all affected facilities shall be run at full operating conditions and flow rates during any performance test.

(b) The following methods in appendix A to this part, except as provided under § 60.8(b) shall be used as reference methods to determine compliance with the emission limit or percent reduction efficiency specified under § 60.612(a).

(1) Method 1 or 1A, as appropriate, for selection of the sampling sites. The control device inlet sampling site for determination of vent stream molar composition or TOC (less methane and ethane) reduction efficiency shall be prior to the inlet of the control device and after the recovery system.

(2) Method 2, 2A, 2C, or 2D, as appropriate, for determination of the volumetric flow rates.

(3) The emission rate correction factor, integrated sampling and analysis procedure of Method 3 shall be used to determine the oxygen concentration ( $\%\text{O}_{2d}$ ) for the purposes of determining compliance with the 20 ppmv limit.

## Environmental Protection Agency

§ 60.614

The sampling site shall be the same as that of the TOC samples and the samples shall be taken during the same time that the TOC samples are taken. The TOC concentration corrected to 3 percent O<sub>2</sub> (C<sub>c</sub>) shall be computed using the following equation:

$$C_c = C_{\text{TOC}} \frac{17.9}{20.9 - \%O_{2d}}$$

where:

C<sub>c</sub>=Concentration of TOC corrected to 3 percent O<sub>2</sub>, dry basis, ppm by volume.

C<sub>TOC</sub>=Concentration of TOC (minus methane and ethane), dry basis, ppm by volume.

%O<sub>2d</sub>=Concentration of O<sub>2</sub>, dry basis, percent by volume.

(4) Method 18 to determine concentration of TOC in the control device outlet and the concentration of TOC in the inlet when the reduction efficiency of the control device is to be determined.

(i) The sampling time for each run shall be 1 hour in which either an integrated sample or four grab samples shall be taken. If grab sampling is used then the samples shall be taken at 15-minute intervals.

(ii) The emission reduction (R) of TOC (minus methane and ethane) shall be determined using the following equation:

$$R = \frac{E_i - E_o}{E_i} \times 100$$

where:

R=Emission reduction, percent by weight.

E<sub>i</sub>=Mass rate of TOC entering the control device, kg TOC/hr.

E<sub>o</sub>=Mass rate of TOC discharged to the atmosphere, kg TOC/hr.

(iii) The mass rates of TOC (E<sub>i</sub>, E<sub>o</sub>) shall be computed using the following equations:

$$E_i = K_2 \left( \sum_{j=1}^n C_{ij} M_{ij} \right) Q_i$$

$$E_o = K_2 \left( \sum_{j=1}^n C_{oj} M_{oj} \right) Q_o$$

Where:

C<sub>ij</sub>, C<sub>oj</sub>=Concentration of sample component "j" of the gas stream at the inlet and

outlet of the control device, respectively, dry basis ppm by volume.

M<sub>ij</sub>, M<sub>oj</sub>=Molecular weight of sample component "j" of the gas stream at the inlet and outlet of the control device, respectively, g/g-mole (lb/lb-mole).

Q<sub>i</sub>, Q<sub>o</sub>=Flow rate of gas stream at the inlet and outlet of the control device, respectively, dscm/min (dscf/hr).

K<sub>2</sub>=Constant, 2.494 x 10<sup>-6</sup> (l/ppm) (g-mole/scm) (kg/g) (min/hr), where standard temperature for (g-mole/scm) is 20 °C.

(iv) The TOC concentration (C<sub>TOC</sub>) is the sum of the individual components and shall be computed for each run using the following equation:

$$C_{\text{TOC}} = \sum_{j=1}^n C_j$$

where:

C<sub>TOC</sub>=Concentration of TOC (minus methane and ethane), dry basis, ppm by volume.

C<sub>j</sub>=Concentration of sample components in the sample.

n=Number of components in the sample.

(5) When a boiler or process heater with a design heat input capacity of 44 MW (150 million Btu/hour) or greater is used to seek to comply with §60.612(a), the requirement for an initial performance test is waived, in accordance with §60.8(b). However, the Administrator reserves the option to require testing at such other times as may be required, as provided for in section 114 of the Act.

(c) When a flare is used to seek to comply with §60.612(b), the flare shall comply with the requirements of §60.18.

(d) The following test methods in appendix A to this part, except as provided under §60.8(b), shall be used for determining the net heating value of the gas combusted to determine compliance under §60.612(b) and for determining the process vent stream TRE index value to determine compliance under §60.612(c).

(1)(i) Method 1 or 1A, as appropriate, for selection of the sampling site. The sampling site for the vent stream flow rate and molar composition determination prescribed in §60.614(d) (2) and (3) shall be, except for the situations outlined in paragraph (d)(1)(ii) of this section, prior to the inlet of any control device, prior to any post-reactor dilution of the stream with air, and prior

# § 60.614

to any post-reactor introduction of halogenated compounds into the vent stream. No transverse site selection method is needed for vents smaller than 4 inches in diameter.

(ii) If any gas stream other than the air oxidation vent stream from the affected facility is normally conducted through the final recovery device.

(A) The sampling site for vent stream flow rate and molar composition shall be prior to the final recovery device and prior to the point at which the nonair oxidation stream is introduced.

(B) The efficiency of the final recovery device is determined by measuring the TOC concentration using Method 18 at the inlet to the final recovery device after the introduction of any nonair oxidation vent stream and at the outlet of the final recovery device.

(C) This efficiency is applied to the TOC concentration measured prior to the final recovery device and prior to the introduction of the nonair oxidation stream to determine the concentration of TOC in the air oxidation stream from the final recovery device. This concentration of TOC is then used to perform the calculations outlined in § 60.614(d) (4) and (5).

(2) The molar composition of the process vent stream shall be determined as follows:

(i) Method 18 to measure the concentration of TOC including those containing halogens.

(ii) ASTM D1946-77 (incorporation by reference as specified in § 60.17 of this part) to measure the concentration of carbon monoxide and hydrogen.

(iii) Method 4 to measure the content of water vapor.

(3) The volumetric flow rate shall be determined using Method 2, 2A, 2C, or 2D, as appropriate.

(4) The net heating value of the vent stream shall be calculated using the following equation:

$$H_T = K_1 \left( \sum_{j=1}^n C_j H_j \right)$$

where:

$H_T$ =Net heating value of the sample, MJ/scm, where the net enthalpy per mole of offgas is based on combustion at 25 °C and 760 mm Hg, but the standard temperature for determining the volume cor-

# 40 CFR Ch. I (7-1-00 Edition)

responding to one mole is 20 °C, as in the definition of  $Q_s$  (offgas flow rate).

$K_1$ =Constant,  $1.740 \times 10^{-7}$

$$\frac{(1) \text{ (g mole) (MJ),}}{\text{ppm scm kcal}}$$

where standard temperature for

$$\frac{(\text{g-mole})}{\text{scm}}$$

is 20 °C.

$C_j$ =Concentration of compound j in ppm, as measured for organics by Method 18 and measured for hydrogen and carbon monoxide by ASTM D1946-77 (incorporated by reference as specified in § 60.17 of this part) as indicated in § 60.614(d)(2).

$H_j$ =Net heat of combustion j, kcal/g-mole, based on combustion at 25 °C and 760 mm Hg. The heats of combustion of vent stream components would be required to be determined using ASTM D2382-76 (incorporation by reference as specified in § 60.17 of this part) if published values are not available or cannot be calculated.

(5) The emission rate of TOC in the process vent stream shall be calculated using the following equation:

$$E_{\text{TOC}} = K_2 \left[ \sum_{j=1}^n C_j M_j \right] Q_s$$

where:

$E_{\text{TOC}}$ =Emission rate of TOC in the sample, kg/hr

$K_2$ =Constant,  $2.494 \times 10^{-6}$  (1/ppm) (g-mole/scm) (kg/g) (min/hr), where standard temperature for (g-mole/scm) is 20 °C

$C_j$ =Concentration on a basis of compound j in ppm as measured by Method 18 as indicated in § 60.614(d)(2)

$M_j$ =Molecular weight of sample j, g/g-mole

$Q_s$ =Vent stream flow rate (scm/min) at a standard temperature of 20 °C

(6) The total process vent stream concentration (by volume) of compounds containing halogens (ppmv, by compound) shall be summed from the individual concentrations of compounds containing halogens which were measured by Method 18.

(e) For purposes of complying with § 60.612(c), the owner or operator of a facility affected by this subpart shall calculate the TRE index value of the vent stream using the equation for incineration in paragraph (e)(1) of this section for halogenated vent streams. The owner or operator of an affected

**Environmental Protection Agency****§ 60.614**

facility with a nonhalogenated vent stream shall determine the TRE index value by calculating values using both the incinerator equation in paragraph (e)(1) of this section and the flare equation in paragraph (e)(2) of this section

and selecting the lower of the two values.

(1) The TRE index value of the vent stream controlled by an incinerator shall be calculated using the following equation:

$$\text{TRE} = \frac{1}{E_{\text{TOC}}} \left[ a + b(Q_s)^{0.88} + c(Q_s) + d(Q_s)(H_T) + e(Q_s)^{0.88}(H_T)^{0.88} + f(Y_s)^{0.5} \right]$$

(i) where for a vent stream flow rate (scm/min) at a standard temperature of 20 °C that is greater than or equal to 14.2 scm/min:

TRE=TRE index value.

$Q_s$ =Vent stream flow rate (scm/min), at a standard temperature of 20 °C.

$H_T$ =Vent stream net heating value (MJ/scm), where the net enthalpy of combustion per mole of vent stream is based on combustion at 25 °C and 760 mm Hg, but the standard temperature for determining

the volume corresponding to one mole is 20 °C, as in the definition of  $Q_s$ .

$Y_s=Q_s$  for all vent stream categories listed in Table 1 except for Category E vent streams where  $Y_s=(Q_s)(H_T)/3.6$ .

$E_{\text{TOC}}$ =Hourly emissions of TOC reported in kg/hr.

a, b, c, d, e, and f are coefficients.

The set of coefficients which apply to a vent stream shall be obtained from Table 1.

TABLE 1. AIR OXIDATION NSPS TRE COEFFICIENTS FOR VENT STREAMS CONTROLLED BY AN INCINERATOR

DESIGN CATEGORY A1. FOR HALOGENATED PROCESS VENT STREAMS, IF  $0 \leq$  NET HEATING VALUE (MJ/scm)  $\leq 3.5$ :

$Q_s$ = Vent Stream Flow rate (scm/min)	a	b	c	d	e	f
$14.2 < Q_s \leq 18.8$	19.18370	0.27580	0.75762	-0.13064	0	0.01025
$18.8 < Q_s \leq 699$	20.00563	0.27580	0.30387	-0.13064	0	0.01025
$699 < Q_s \leq 1400$	39.87022	0.29973	0.30387	-0.13064	0	0.01449
$1400 < Q_s \leq 2100$	59.73481	0.31467	0.30387	-0.13064	0	0.01775
$2100 < Q_s \leq 2800$	79.59941	0.32572	0.30387	-0.13064	0	0.02049
$2800 < Q_s \leq 3500$	99.46400	0.33456	0.30387	-0.13064	0	0.02291

DESIGN CATEGORY A2. FOR HALOGENATED PROCESS VENT STREAMS, IF NET HEATING VALUE  $> 3.5$  MJ/scm:

$Q_s$ = Vent Stream Flow rate (scm/min)	a	b	c	d	e	f
$14.2 < Q_s \leq 18.8$	18.84466	0.26742	-0.20044	0	0	0.01025
$18.8 < Q_s \leq 699$	19.66658	0.26742	-0.25332	0	0	0.01025
$699 < Q_s \leq 1400$	39.19213	0.29062	-0.25332	0	0	0.01449
$1400 < Q_s \leq 2100$	58.71768	0.30511	-0.25332	0	0	0.01775
$2100 < Q_s \leq 2800$	78.24323	0.31582	-0.25332	0	0	0.02049
$2800 < Q_s \leq 3500$	97.76879	0.32439	-0.25332	0	0	0.02291

DESIGN CATEGORY B. FOR NONHALOGENATED PROCESS VENT STREAMS, IF  $0 \leq$  NET HEATING VALUE (MJ/scm)  $\leq 0.48$ :

$Q_s$ = Vent Stream Flow rate (scm/min)	a	b	c	d	e	f
$14.2 < Q_s \leq 1340$	8.54245	0.10555	0.09030	-0.17109	0	0.01025
$1340 < Q_s \leq 2690$	16.94386	0.11470	0.09030	-0.17109	0	0.01449
$2690 < Q_s \leq 4040$	25.34528	0.12042	0.09030	-0.17109	0	0.01775

DESIGN CATEGORY C. FOR NONHALOGENATED PROCESS VENT STREAMS, IF  $0.48 <$  NET HEATING VALUE (MJ/scm)  $\leq 1.9$ :

$Q_s$ = Vent Stream Flow rate (scm/min)	a	b	c	d	e	f
$14.2 < Q_s \leq 1340$	9.25233	0.06105	0.31937	-0.16181	0	0.01025
$1340 < Q_s \leq 2690$	18.36363	0.06635	0.31937	-0.16181	0	0.01449
$2690 < Q_s \leq 4040$	27.47492	0.06965	0.31937	-0.16181	0	0.01775

DESIGN CATEGORY D. FOR NONHALOGENATED PROCESS VENT STREAMS, IF  $1.9 <$  NET HEATING VALUE (MJ/scm)  $\leq 3.6$ :

$Q_s$ = Vent Stream Flow rate (scm/min)	a	b	c	d	e	f
$14.2 < Q_s \leq 1180$	6.67868	0.06943	0.02582	0	0	0.01025
$1180 < Q_s \leq 2370$	13.21633	0.07546	0.02582	0	0	0.01449
$2370 < Q_s \leq 3550$	19.75398	0.07922	0.02582	0	0	0.01775

DESIGN CATEGORY E. FOR NONHALOGENATED PROCESS VENT STREAMS, IF NET HEATING VALUE  $> 3.6$  MJ/scm:

$Y_s$ = Dilution Flow rate (scm/min) $\neq (Q_s)(H_T)/3.6$	a	b	c	d	e	f
$14.2 < Y_s \leq 1180$	6.67868	0	0	-0.00707	0.02220	0.01025
$1180 < Y_s \leq 2370$	13.21633	0	0	-0.00707	0.02412	0.01449
$2370 < Y_s \leq 3550$	19.75398	0	0	-0.00707	0.02533	0.01775

(ii) Where for a vent stream flow rate (scm/min) at a standard temperature of 20 °C that is less than 14.2 scm/min:

TRE=TRE index value.

$Q_s=14.2$  scm/min.

$H_T=(\text{FLOW})(\text{HVAL})/14.2$ .

Where the following inputs are used:

FLOW=Vent stream flow rate (scm/min), at a standard temperature of 20 °C.

## Environmental Protection Agency

## § 60.615

HVAL=Vent stream net heating value (MJ/scm), where the net enthalpy per mole of vent stream is based on combustion at 25 °C and 760 mm Hg, but the standard temperature for determining the volume corresponding to 1 mole is 20 °C as in the definition of  $Q_s$ .

$Y_s$ =14.2 scm/min for all vent stream categories listed in Table 1 except for Category E vent streams, where  $Y_s=(14.2)(H_T)/3.6$ .

$E_{TOC}$ =Hourly emissions of TOC reported in kg/hr.

a, b, c, d, e, and f are coefficients.

The set of coefficients that apply to a vent stream can be obtained from Table 1.

(2) The equation for calculating the TRE index value of a vent stream controlled by a flare is as follows:

$$TRE = \frac{1}{E_{TOC}} \left[ a(Q_s) + b(Q_s)^{0.8} + c(Q_s)(H_T) + d(E_{TOC}) + e \right]$$

where:

TRE=TRE index value.

$E_{TOC}$ =Hourly emission rate of TOC reported in kg/hr.

$Q_s$ =Vent stream flow rate (scm/min) at a standard temperature of 20 °C.

$H_T$ =Vent stream net heating value (MJ/scm) where the net enthalpy per mole of offgas is based on combustion at 25 °C and 760

mm Hg, but the standard temperature for determining the volume corresponding to 1 mole is 20 °C as in the definition of  $Q_s$ .

a, b, c, d, and e are coefficients.

The set of coefficients that apply to a vent stream shall be obtained from Table 2.

TABLE 2—AIR OXIDATION PROCESSES NSPS TRE COEFFICIENTS FOR VENT STREAMS CONTROLLED BY A FLARE

	a	b	c	d	e
$H_T < 11.2$ MJ/scm .....	2.25	0.288	−0.193	−0.0051	2.08
$H_T \geq 11.2$ MJ/scm .....	0.309	0.0619	−0.0043	−0.0034	2.08

(f) Each owner or operator of an affected facility seeking to comply with § 60.610(c) or § 60.612(c) shall recalculate the TRE index value for that affected facility whenever process changes are made. Some examples of process changes are changes in production capacity, feedstock type, or catalyst type, or whenever there is replacement, removal, or addition of recovery equipment. The TRE index value shall be recalculated based on test data, or on best engineering estimates of the effects of the change to the recovery system.

(1) Where the recalculated TRE index value is less than or equal to 1.0, the owner or operator shall notify the Administrator within 1 week of the recalculation and shall conduct a performance test according to the methods and procedures required by § 60.614 to determine compliance with § 60.612(a). Performance tests must be conducted as

soon as possible after the process change but no later than 180 days from the time of the process change.

(2) Where the initial TRE index value is greater than 4.0 and the recalculated TRE index value is less than or equal to 4.0, but greater than 1.0, the owner or operator shall conduct a performance test in accordance with § 60.8 and § 60.614 and shall comply with §§ 60.613, 60.614, and 60.615. Performance tests must be conducted as soon as possible after the process change but no later than 180 days from the time of the process change.

[55 FR 26922, June 29, 1990; 55 FR 36932, Sept. 7, 1990]

### § 60.615 Reporting and recordkeeping requirements.

(a) Each owner or operator subject to § 60.612 shall notify the Administrator of the specific provisions of § 60.612 (§ 60.612 (a) (b), or (c)) with which the